

Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

United States
Department of
Agriculture

Forest Service

Intermountain
Forest and Range
Experiment Station

Research Note
INT-313

May 1981

Identifying Sheep Killed by Bears

David E. Griffel and
Joseph V. Basile¹

ABSTRACT

520 Sheep carcasses located on four allotments over a 3-year period were examined for cause of death, and predator-inflicted damage to sheep was noted. Carrion feeding was distinguishable from predation. Bear kills were readily separated from coyote kills, but the kill techniques of black bears and grizzly bears were too similar to distinguish between them from carcasses alone; other signs at the kill site provided the best clue to the responsible bear species. Predators were responsible for 89 percent of the losses, or 2.8 percent of the sheep grazed. Black bears killed over three times more sheep than grizzly bears killed. //

KEYWORDS: predation, sheep, black bear, grizzly bear, *Ursus americanus*, *Ursus arctos horribilis*

Bear/domestic sheep relationships were monitored on the Targhee National Forest in southeastern Idaho for three grazing seasons. The objectives were to verify and quantify sheep losses on four allotments that have a history of black bear (*Ursus americanus*) and grizzly bear (*Ursus arctos horribilis*) occurrence, and to determine, where possible, the predator species responsible for the losses. This paper presents criteria for identifying sheep killed by black bears and grizzly bears.

Methods

Sheep bedgrounds and their surroundings and trails to the bedgrounds were searched for sheep carcasses four to

five times per week during the allotment periods. Each loss was categorized as to cause: black bear, grizzly bear, coyote (*Canis latrans*), or nonpredator related cause, such as disease, poisonous plant, accident, and old age.

The physical damage sustained by a sheep during an initial attack furnished the primary evidence of cause of death. Although bear kills were easily separated from other causes of mortality, differentiating between black bear kills and grizzly bear kills proved difficult because kill techniques are similar. Tracks at the kill sites provided the best clue to the bear species responsible. Carrion feeding was distinguished from predation by the lack of subcutaneous hemorrhage around puncture wounds, an indication that the animal was dead when first bitten or clawed (Davenport and others 1973).

Results and Discussion

Of 19,225 sheep that grazed the allotments over 3 years, 614 (3.2 percent) failed to return. Of 415 carcasses, 370 bore evidence of death by predator and 45, of death from other causes (table 1). The remaining 199 lost sheep were not located. Presumably, their fate paralleled that of dead sheep that were located. If so, approximately 89 percent or 177 were lost to predators.

¹The authors are, respectively, Wildlife Biologist, Bridger-Teton National Forest, Jackson, Wyo., and Range Scientist, located at the Intermountain Station's Forestry Sciences Laboratory, Bozeman, Mont.

Bears killed 332 sheep of which 56 percent were lambs and 44 percent were ewes (table 1). Eighteen black bears were believed to be responsible for 252 sheep deaths and eight grizzly bears for 80. The numbers of sheep killed in each of 151 attack incidents ranged from 1 to 6 and averaged 2.2. Sixteen sheep (nine lambs and seven ewes) survived bear-inflicted injuries in seven incidents. Sheep deaths occurred in three of those incidents. During the 3 years, coyotes killed 35 lambs and three ewes in 21 incidents. Kills ranged from 1 to 4 sheep per incident and averaged 1.8.

Typically, sheep killed by bear had two or more puncture wounds in the nape and/or skull, accompanied by subcutaneous hemorrhaging. Hemorrhaging was noticeable as bloodshot areas just under the skin immediately surrounding the punctures. These puncture wounds, produced by the bear's canine teeth, were found on the napes of 240 carcasses and in the frontal or jugal bones of the skulls of 109 carcasses.

Each of these workers concluded that deaths in their respective studies were caused by bite wounds. The nasal and facial regions of sheep, which contain several major nerve branches from four different cranial nerves, are particularly sensitive to injury. Mysterud (1975) hypothesized that a deep and sudden bite to either region induces shock and paralysis that results in unconsciousness and hypoxic asphyxiation. In this respect, the biting and killing method of the bears in his study differed from the method commonly associated with mammalian predators, which involves either suffocation through throat bite or brain and spinal cord damage.

Murie (1948) speculated that bites in the lumbar region temporarily paralyzed cattle, but he did not claim death as

In our study, about 20 percent of the bear-killed sheep carcasses showed evidence of facial bites only and therefore, if Mysterud's hypothesis is correct, suggest death by asphyxiation. Another 10 percent of the carcasses showed both facial and nape bites and the remaining 70 percent bore evidence of nape bites only.

Both Mysterud (1975) and Murie (1948) discount a crushing blow with the forepaw--the reputed kill technique of both the grizzly and the brown bear (Elgmork 1978)--as the cause of death. Murie (1948) insists that the grizzly does not attack by striking with the paws, but instead seizes and holds a victim with its "arms" so as to administer the killing bite. If an animal seized by a bear manages to pull away, it is likely to be clawed. Cole (1972) reported that the grizzly bear attacks elk by rearing on its hind legs and grasping the elk on or over the rump and then letting its weight pull the victim down. To kill, the bear first grabs the elk's neck and shakes the animal vigorously, then it rolls the elk on its back, and opens its abdomen.

Jorgensen (1979) reported the attack/kill methods of bears on sheep as described by several observers on the Targhee National Forest. One sheepman described kills that appeared to have been caused by bears straddling and clawing the backs of sheep; another sheepman ascribed kills to neck bites. A predator control agent blamed clawing and "batting" for the kills he had observed; another agent reported that he has seen more sheep that had been killed by powerful blows than he has seen sheep killed by neck bites. He claimed that the blows failed to break the skin, but that subcutaneous hemorrhaging, often accompanied by a broken neck, was characteristic.

Although we have never witnessed a bear attacking sheep, we suspect the usual mode of attack in our study area has been a grasping action rather than a striking blow. A blow sufficiently powerful to kill an animal most likely would have left the telltale marks mentioned above--broken neck, and a subcutaneous hemorrhage under unbroken skin at the site of the blow. We have found no evidence of this. Instead, all subcutaneous hemorrhages were associated with bite wounds, and every bear-killed carcass bore

[illegible]

claw-inflicted lacerations over the cervical, thoracic, or lumbar regions. The 16 sheep that escaped bear attacks with nonfatal injuries were similarly lacerated. We speculate that these lacerations resulted from the sheep trying to escape a bear's grasp.

We cannot discount the possibility that some lacerations resulted from glancing blows or swats not sufficiently well placed to kill the sheep, but powerful enough to slow or stop it and allow the bear to administer the killing bite.

In an incident outside our study allotments, two subadult grizzlies killed 30 sheep in one evening. An undetermined number of these apparently were struck while running; as the sheep fell and were rolled over, the bears ripped open their abdomens and their viscera became extended. This incident supports Spencer's (1955) suggestion, reported by Jorgensen (1979), that the bite attack is more common in one-on-one encounters and forepaw blows are characteristic of mass killings.

Sheep killed by coyotes were distinguishable from those killed by bear because coyotes usually bite sheep on the underside of the neck just behind or below the ear (Connolly and others 1976; Bowns 1976). Oftentimes the victim's throat is ripped out. All 38 coyote-killed sheep had throat damage.

Carcass Dragging

Bears dragged 60 percent of the carcasses approximately 75 to 150 ft. (23 to 46 m) from the kill sites and the rest less than 65 ft. (20 m). Coyotes seldom moved carcasses more than 3 ft. (1 m), particularly in timbered areas.

Carcass Consumption

The 243 carcasses fed upon by bears revealed a pattern of consumption. Point of entry was the udder (74 percent) or the flank (26 percent); on all lactating ewes the udder was consumed first. Carcasses were opened ventrally from the udder forward and the viscera were cleanly removed. The heart and liver were eaten next. If the carcass was fed upon further, the bear removed the hide, usually intact, by splitting it over the rib cage and peeling it off the more fleshy portions of the carcass. The animal ate the articulation of the costal arch and sternum, leaving jagged-ended ribs attached to the vertebrae. The bear next ate the proximal end of the front shoulder, leaving the hind quarters for last.

Coyotes partially consumed 13 (lambs) of the 38 sheep they killed, gaining entry into all but one of these through the flank immediately anterior to the hind leg and through the udder on the one remaining carcass. This agrees with findings by Roy and Dorrance (1976), who reported that entry was typically through the flank. Coyotes tended to eat more of the viscera, fatty, and meaty portions of the carcass and to leave the larger bones, which many times bears consumed. Coyotes seldom removed the hide intact as bears did.

Eighty-nine (27 percent) of the sheep killed by bears were not fed upon, but another 88 (27 percent) were totally consumed within 12 hours of the estimated time of kill. The remaining 155 carcasses (47 percent) were only partially consumed within 12 hours of the kill. The bear usually returned within 18 to 36 hours of the kill to finish eating the carcass.

Coyotes did not return to any of their kills; bears usually ate the coyote kills within 1 1/2 days of the kill.

Eighteen of the 45 nonpredator related losses were examined within an estimated 4 hours of death and bore no sign of predator damage. The other 27 had been partially fed upon by bears. Sheep fed upon by bears as carrion can be distinguished from sheep killed by bears. A lack of canine tooth punctures in the neck, shoulder, or facial regions, of hemorrhaging, and of lacerations over the back indicate that the bear was consuming carrion and did not kill the sheep. Cause of these deaths may be labelled erroneously, yielding a biased estimate of losses to predators.

Publications Cited

- Bowns, J. E.
1976. Field criteria for predator damage assessment. *Utah Sci.* 37(1): 26-30.
- Cole, G. F.
1972. Grizzly bear-elk relationships in Yellowstone National Park. *J. Wildl. Manage.* 36(2):556-561.
- Connolly, G. E., R. M. Timm, W. E. Howard, and W. M. Longhurst.
1976. Sheep killing behavior of captive coyotes. *J. Wildl. Manage.* 40(3):400-407.
- Davenport, J. W., J. E. Bowns, and J. P. Workman.
1973. Assessment of sheep losses to coyotes--a problem to Utah sheepmen--a concern of Utah researchers. *Utah State Univ. Agric. Exp. Stn. Res. Rep.* 7, Logan, 17 p.
- Davenport, L. B., Jr.
1953. Agricultural depredation by the black bear in Virginia. *J. Wildl. Manage.* 17(3):331-340.
- Elgmork, K.
1978. Striking blows by the brown bear. *Fauna (Oslo)* 31(3):157-164.
- Jorgensen, C.
1979. Bear-livestock interactions, Targhee National Forest. M. S. thesis. Univ. of Mont., Missoula. 153 p.
- Murie, A.
1948. Cattle on grizzly bear range. *J. Wildl. Manage.* 12(1):57-72.
- Mysterud, I.
1975. Sheep killing and feeding behaviour of the brown bear (*Ursus arctos*) in Trysil, south Norway 1973. *Norw. J. Zool.* 23:243-260.
- Roy, L. D., and M. J. Dorrance.
1976. Methods of investigating predation on domestic livestock. A manual for investigating officers. Alberta Agric. Plant Ind. Lab. 54 p.
- Spencer, H. E., Jr.
1955. The black bear and its status in Maine. *Maine Inland Fish. and Game, Game Div. Bull.* 4, Bangor, 55 p.

The Intermountain Station, headquartered in Ogden, Utah, is one of eight regional experiment stations charged with providing scientific knowledge to help resource managers meet human needs and protect forest and range ecosystems.

The Intermountain Station includes the States of Montana, Idaho, Utah, Nevada, and western Wyoming. About 231 million acres, or 85 percent, of the land area in the Station territory are classified as forest and rangeland. These lands include grasslands, deserts, shrublands, alpine areas, and well-stocked forests. They supply fiber for forest industries; minerals for energy and industrial development; and water for domestic and industrial consumption. They also provide recreation opportunities for millions of visitors each year.

Field programs and research work units of the Station are maintained in:

Boise, Idaho

Bozeman, Montana (in cooperation with Montana State University)

Logan, Utah (in cooperation with Utah State University)

Missoula, Montana (in cooperation with the University of Montana)

Moscow, Idaho (in cooperation with the University of Idaho)

Provo, Utah (in cooperation with Brigham Young University)

Reno, Nevada (in cooperation with the University of Nevada)

